What is claimed is:

1. A method of manufacturing a semiconductor device having electrodes penetrating a semiconductor substrate, the method comprising the steps of:

forming a concave portion extending from an active surface of a semiconductor substrate on which an integrated circuit is formed to an interior of the semiconductor substrate;

forming a first insulating layer on an inner surface of the concave portion;

filling an inner side of the first insulating layer with an electroconductive material so as to form an electrode;

exposing a distal end portion of the first insulating layer by etching a rear surface of the semiconductor substrate;

forming a second insulating layer on the rear surface of the substrate; and

exposing the distal end portion of the electrode by removing the first insulating layer and the second insulating layer from a distal end portion of the electrode.

2. A method of manufacturing a semiconductor device according to claim 1, further comprising a step of attaching, before the rear surface of the semiconductor substrate is etched, a reinforcing member that reinforces the semiconductor substrate to the active surface of the semiconductor substrate via a hardening adhesive agent.

3. A method of manufacturing a semiconductor device according to claim 1, further comprising the steps of:

forming, before the electrode is formed, a barrier layer that prevents the electroconductive material from spreading to the semiconductor substrate on an interior

side of the first insulating layer; and

exposing the distal end portion of the electrode by removing the barrier layer at the distal end portion of the electrode at the same time as removing the first insulating layer and the second insulating layer at the distal end portion of the electrode.

4. A method of manufacturing a semiconductor device according to claim 1, wherein, in the step of forming the second insulating layer, a coating of silicon oxide or silicon nitride that constitutes the second insulating layer is formed using a CVD method.

5. A method of manufacturing a semiconductor device according to claim 1, wherein, in the step of forming the second insulating layer, a liquid SOG or polyimide that is a base material of the second insulating layer is coated using a spin coating method.

6. A method of manufacturing a semiconductor device according to claim 1, wherein the step for forming the electrode further comprising the steps of:

forming an electrode distal end portion formed from a first electroconductive material on a bottom surface of the concave portion on an inner side of the first insulating layer; and

forming an electrode body that is formed from a second electroconductive material and is connected to the electrode distal end portion on an inner side of the first insulating layer, and

wherein, in the step of exposing the electrode, the electrode distal end portion is exposed by removing the first insulating layer that is formed on top of a distal end surface of the electrode distal end portion, and

wherein the first electroconductive material is less readily oxidized than the

second electroconductive material.

7. A method of manufacturing a semiconductor device according to claim 6, wherein, in the step of forming the electrode distal end portion, a liquid body containing the first electroconductive material is discharged using a droplet discharge apparatus onto the bottom surface of the concave portion on an inner side of the first insulating layer, and the discharged liquid body is then baked.

8. A method of manufacturing a semiconductor device having electrodes penetrating a semiconductor substrate, the method comprising the steps of:

forming a concave portion extending from an active surface of a semiconductor substrate on which an integrated circuit is formed to an interior of the semiconductor substrate;

forming a first insulating layer on an inner surface of the concave portion;

forming an electrode distal end portion formed from a first electroconductive material on a bottom surface of the concave portion on an inner side of the first insulating layer;

forming an electrode body that is formed from a second electroconductive material and is connected to the electrode distal end portion on the inner side of the first insulating layer;

exposing a distal end portion of the first insulating layer by etching a rear surface of the semiconductor substrate; and

exposing the electrode distal end portion by removing the first insulating layer that is formed on a distal end surface of the electrode distal end portion,

wherein the material used for the first electroconductive material is less readily

oxidized than the material used for the second electroconductive material.

9. A method of manufacturing a semiconductor device according to claim 8, wherein, in the step of forming the electrode distal end portion, a liquid body containing the first electroconductive material is discharged using a droplet discharge apparatus onto the bottom surface of the concave portion on an inner side of the first insulating layer, and the discharged liquid body is then baked.

10. A method of manufacturing a semiconductor device according to claim 8, further comprising a step of forming, after the step of etching the rear surface of the semiconductor substrate, a second insulating layer on the rear surface of the semiconductor substrate,

wherein, in the step of removing the first insulating layer that is formed on a distal end surface of the electrode distal end portion, the electrode distal end portion is exposed by removing the second insulating layer that is formed on the distal end surface of the electrode distal end portion.

11. A semiconductor device manufactured using the method of manufacturing a semiconductor device according to claim 1.

12. A semiconductor device wherein a plurality of the semiconductor devices according to claim 11 are stacked, and

the electrodes of vertically adjacent semiconductor devices are electrically connected by solder or by a brazing material.

13. A semiconductor device comprising:

a semiconductor substrate on which an integrated circuit is formed;

an electrode formed via a first insulating layer inside a through hole extending from an active surface of the semiconductor substrate to a rear surface of the semiconductor substrate; and

a second insulating layer formed on the rear surface of the semiconductor substrate in at least a periphery of the electrode.

14. A semiconductor device according to claim 13, wherein the distal end surface of the electrode on the rear side of the semiconductor substrate is formed protruding from a surface of the second insulating layer.

15. A semiconductor device according to claim 13, wherein the distal end surface of the electrode on the rear side of the semiconductor substrate is formed on substantially the same plane as a surface of the second insulating layer.

16. A semiconductor device according to claim 13, wherein the second insulating layer is formed from silicon oxide, silicon nitride or polyimide.

17. A semiconductor device in which a plurality of the semiconductor devices according to claim 13 are stacked, and

the electrodes of vertically adjacent semiconductor devices are electrically connected by solder or by a brazing material.

18. A semiconductor device manufactured using the method of manufacturing a

semiconductor device according to claim 8.

19. A semiconductor device in which a plurality of the semiconductor devices according to claim 18 are stacked, and

the electrode distal end portion of one of the vertically adjacent semiconductor devices is electrically connected by solder or by a brazing material to the electrode body of the other of the vertically adjacent semiconductor devices.

20. A semiconductor device comprising:

a semiconductor substrate on which an integrated circuit is formed;

an electrode body formed via a first insulating layer inside a through hole extending from an active surface of the semiconductor substrate to the rear surface of the semiconductor substrate; and

an electrode distal end portion formed at a distal end portion of the electrode body on a rear side of the semiconductor substrate, and formed from an electroconductive material that is less readily oxidized than the constituent material of the electrode body.

21. A semiconductor device according to claim 20, wherein the constituent material of the electrode distal end portion is gold or silver.

22. A semiconductor device according to claim 20, wherein the second insulating layer is formed on the rear surface of the semiconductor substrate in at least a periphery of the electrode distal end portion.

23. A semiconductor device according to claim 22, wherein the distal end surface of the electrode distal end portion is formed protruding from a surface of the second insulating layer.

24. A semiconductor device according to claim 22, wherein the distal end surface of the electrode distal end portion is formed on substantially the same plane as a surface of the second insulating layer.

25. A semiconductor device in which a plurality of the semiconductor devices according to claim 20 are stacked, and

the electrode distal end portion of one of the vertically adjacent semiconductor devices is electrically connected by solder or by a brazing material to the electrode body of the other of the vertically adjacent semiconductor devices.

26. A circuit substrate on which the semiconductor substrate device according to claim 12 is packaged.

27. A circuit substrate on which the semiconductor substrate device according to claim 13 is packaged.

28. A circuit substrate on which the semiconductor substrate device according to claim 19 is packaged.

29. A circuit substrate on which the semiconductor substrate device according to claim 25 is packaged.

30. An electronic apparatus comprising the semiconductor device according to claim 12.

31. An electronic apparatus comprising the semiconductor device according to claim 13.

32. An electronic apparatus comprising the semiconductor device according to claim 19.

33. An electronic apparatus comprising the semiconductor device according to claim 25.